***A new, high-power direct-broadcast satellite promises to change the way America looks at TV.***

BRIAN C. FENTON

# THE NEW AGE OF SATELLITE TV

BEGINNING THIS APRIL, CONSUMERS IN THE U.S. will have another option for receiving television programming. A new direct-broadcast satellite, now in geosynchronous orbit, will begin beaming programming to satellite dishes only 18 inches in diameter. The digital signals will be decoded by an integrated receiver/descrambler which will reproduce them with "near-laserdisc quality." The programming, which will be available from two suppliers, will consist of up to 150 channels of cable networks, movies, sports, and pay-per-view events. Audio programming with "compact-disc quality" will also be available.

Direct satellite broadcasting to small-dish antennas has been attempted several times since the FCC set aside a portion of the Ku band for high-power broadcasts in 1982. Although other proposed systems have never gotten off the ground, the Digital Satellite System or DSS already has. The first satellite of the two-satellite system was launched in December; the second is scheduled for launch in June.

A number of companies have joined forces—and invested over one billion dollars—to make the new satellite system a reality. Among the main players, Thomson Consumer Electronics is building the receivers and marketing them under its RCA brand name which it purchased from General Electric. Thomson is also developing the digital compression technology. Hughes Space and Communications Company built and launched the first satellite and is building a second one. Di-



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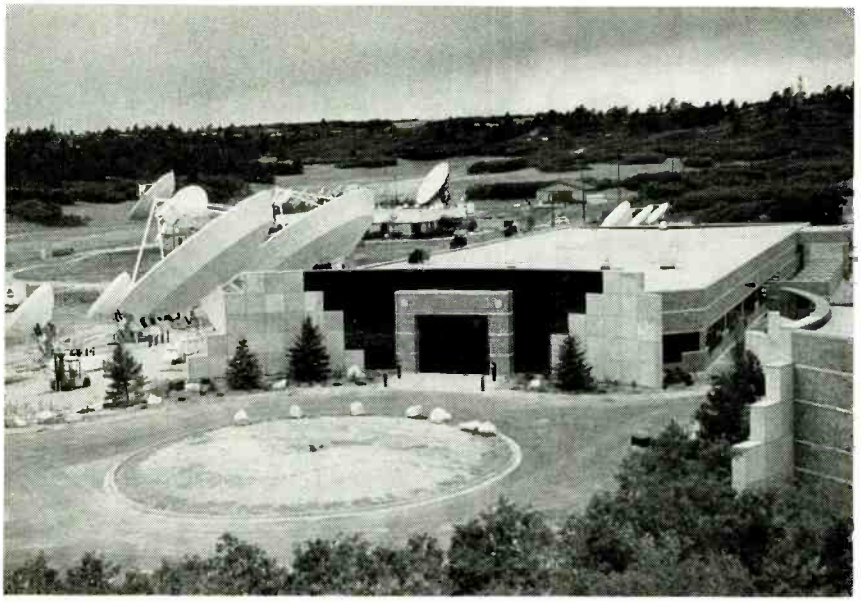

**DIRECTV'S PROGRAMMING WILL BE UPLINKED to the satellite from this facility, shown here under construction, in Castle Rock, Colorado.**

recTv, Inc. a unit of GM Hughes Electronics, is one program distributor. United States Satellite Broadcasting or USSB, a subsidiary of Hubbard Broadcasting, Inc., is the second.

**What can I watch?**

DirecTv owns eleven of the sixteen transponders on the first DBS satellite and all sixteen transponders on the second satellite. USSB owns the other five transponders.

DirecTv will distribute many major cable services including CNN, the Discovery Channel, the Disney Channel, Encore, and six new Encore channels scheduled to begin operation this year. Other programming that can be purchased from DirecTv includes the Sci-Fi Channel, the Weather Channel, ESPN, and four channels from Turner Broadcasting.

Two pricing packages have been announced. All of DirecTv's basic services will be available as a package for $21.95 per month. A premium package, that would include the Encore channels and any other premium service that sign on with DirecTv, will cost $29.95 per month. (The company is actively trying to reach a distribution agreement with HBO and Viacom, which have signed an exclusive agreement with USSB.)

DirecTv also plans to offer pay-per-view movies and sporting events. It has reached agreements with several leading studios including Paramount Pictures, Columbia Pictures, TriStar Pictures, and Universal. Because of its channel capacity, DirecTv will be able to show popular movies on multiple channels, with starting times every half hour. Movies will be priced from $0.99 to $3.99.

Sporting events will also be offered, and they are expected to cost $4 to $6 on a per-game basis. Other pricing plans would allow subscribers to purchase season subscriptions for a team for about $10 or $12 per month. DirecTv also hopes to offer season subscriptions for an entire league. With as many as 30 channels set aside for sporting events, DirecTv is planning to offer "any game from any league on a pay-per-view basis," according to a company spokesman.

USSB will offer at least 22 channels of programming. Initially, its lineup will contain 14 premium channels (including multiplexed and time-shifted HBO, Cinemax, Showtime, and The Movie-Channel) and six basic-cable services. USSB will also provide two free, advertiser-supported services that will be available without restriction to everyone with a DSS home receiving system, whether or not they subscribe to any USSB service. According to USSB, the channels will include news, entertainment, public-service, and children's programming. They won't, however, be available when the service is initially launched.

**DIRECTV PROGRAMMING**

**Monthly**

CBC Newsworld
CNN
CNN Headline News
C-SPAN
C-SPAN2
The Cartoon Network
Country Music Television
Court TV
The Discovery Channel
Disney Channel
E! Entertainment Television
Encore
Encore 2: Love Stories
Encore 3: Western
Encore 4: Tweens
Encore 5: Mystery
Encore 6: Action
Encore 7: True Stories
Encore 8: Starz!
ESPN
Family Channel
The Golf Channel
The Learning Channel
The Nashville Network
Northstar
Sci-Fi Channel
Superstation TBS
TNT
The Travel Channel
Turner Classic Movies
USA Network
The Weather Channel

**Pay-Per View**

Paramount Pictures
Columbia Pictures
Sony Picture Classics
TriStar Pictures
Turner MGM Film Library
Universal Pictures



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**USSB PROGRAMMING**

**Premium Services**

Cinemax East
Cinemax West
Cinemax 2
Flix
HBO East
HBO West
HBO2 East
HBO2 West
HBO3
The Movie Channel East
The Movie Channel West
Showtime East
Showtime West
Showtime 2

**Basic Services**

All News Channel
Comedy Central
Lifetime
MTV
Nickelodeon
VH-1

**THE RCA DSS Digital Satellite System receiver is about the size of a VCR. It has a smart-card slot on its front panel.**

The price for monthly programming from USSB begins at $7.95 for a package of six basic services: MTV, VH1, Nickelodeon, Comedy Central, Lifetime, and the All News Channel. For $23.95, a "Showtime Plus" package includes all basic services plus Showtime East and West, Showtime 2, The Movie Channel East and West, and Flix. An "HBO Plus" package, which includes the East and West feeds of HBO and HBO2, HBO3, Cinemax East and West, Cinemax 2, and the basic services will cost $24.95. All of the programming distributed by USSB is available for a monthly cost of $34.95 under the name "USSB Premium Plus."

The agreements between USSB and HBO, and USSB and Viacom (Showtime and The Movie Channel) grants USSB the exclusive right to distribute the premium channels from the new DBS satellite. As a result, any consumer who wants, for example, both HBO and ESPN will have to order the services through both DirecTv and USSB.

According to Stanley E. Hubbard, USSB President and COO, the exclusive deals are an important way to distinguish between the two program providers. "Every DSS home will be able to have simple, and seamless access to all the programming on the system, whether it's through DirecTv or USSB. So as far as we're concerned it's a non issue." Hubbard went on to say that if every cable system had two service providers, "I don't think that the Cable Act of 1992 ever would have been necessary."

If a consumer chooses to buy programming from both DirecTv and USSB, he will receive two bills. USSB doesn't see that as a drawback, because the bills will also distinguish between the two program providers. USSB also believes that it is important to send a bill that doesn't vary from month to month. According to Hubbard, USSB is "among the believers that DirecTv's pay-per-view offerings are going to be extremely successful and [therefore] there will be some wild swings from month to month. We're frankly afraid to share the bill with them because of that."

## The DSS receiver

A DSS receiver is required for viewing any of the programming offered by DirecTv and USSB. Thomson Consumer Electronics developed the set-top integrated receiver/decoder (IRD) for its RCA DSS Digital Satellite System. Low-volume production of the receiver began last December in Thom-

**FINDING THE SATELLITE**

To receive programming from the new direct-broadcast satellite, the dish must be able to "see" it. In general, the installation site must have a clear view of the southern horizon. The exact aiming coordinates vary from location to location as shown below. Note that the azimuth angles listed are compass headings, but they do not take into account the variation between true south and magnetic south. Call a local airport to find the magnetic deviation in your area.

| City | Azimuth | Elevation |
|---|---|---|
| Atlanta, GA | 207° | 46.6° |
| Chicago, IL | 199° | 39.7° |
| Dallas, TX | 188° | 51.8° |
| Denver, CO | 173° | 44.0° |
| Des Moines, IA | 191° | 41.4° |
| Las Vegas, NV | 157° | 45.6° |
| Los Angeles, CA | 150° | 46.2° |
| Miami, FL | 221° | 51.6° |
| Nashville, TN | 202° | 45.6° |
| New Orleans, LA | 201° | 52.9° |
| New York, NY | 211° | 37.5° |
| Pittsburgh, PA | 210° | 38.4° |
| Portland, ME | 221° | 30.9° |
| St. Louis, MO | 196° | 44.0° |
| Salt Lake City, UT | 163° | 41.2° |
| Santa Fe, NM | 171° | 47.8° |
| Seattle, WA | 151° | 31.5° |
| Washington, DC | 215° | 38.4° |
| Wichita, KS | 185° | 46.3° |



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son's facility in Juarez, Mexico. A second high-speed assembly line will be completed by the middle of the summer, and will give Thomson the capacity to build about one hundred thousand receivers and digital cable boxes per month.

RCA has the exclusive rights to build and market the DSS receivers for eighteen months, or until one million units have been sold. After that, other manufacturers will offer DSS receivers. Sony is the first licensee of the DSS technology.

The digital receiver contains four new custom ICs, including the world's first high-volume decoder for the MPEG-2 compression system developed by the Moving Picture Experts Group.

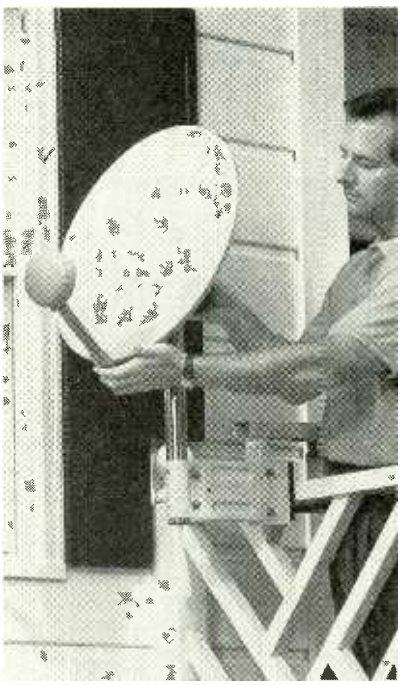
Initially, two DSS models will be available. The basic model is priced at $699, and includes the IRD, an 18×20-inch parabolic dish/antenna, and a universal infrared remote control. Mounted at the focal point of the dish is a low-noise block down-converter (LNB) that receives the signals broadcast from the satellite in the 12.2–12.7 GHZ band; it down converts them to a frequency of 950–1450 MHz. The output of the LNB is fed to the set-top IRD, which decodes the transmission and feeds it to a TV or monitor. Video, S-video, and RF (Channel 3 or 4) outputs are provided.

An upgraded system, priced at $899, will included an LNB with two outputs so that a second IRD can be connected to the system. (A second receiver is required for recording one channel while the viewer is watching a second.) The upgraded receiver will also have two sets of video and two sets of stereo audio outputs. A more capable universal remote control, which can operate a VCR, cable box, laserdisc player, and a TV, will also be included in the step-up system.

Both IRDs include a 15-pin D-style connector on their rear panels for a high-speed data port. A second, 9-pin, low-speed serial data port is offered on the upgrade receiver. At this time, no data services have been announced.

The DSS receiver contains built-in switching so that a TV antenna or cable can be connected up to the system. Current FCC regulations do not permit network signals to be sent via DSS to areas where they can be received easily over the air.

The rear panel of the receiver also contains a modular phone jack. The phone connection is required so that monthly usage—especially pay-per-view events—can be reported to programming providers. It can also ensure that the box hasn't been stolen or moved from its assigned address, which is important for regional program distribution.



**THE SMALL DISH ANTENNA required to receive digital signals from an orbiting should be easy to install. Thomson estimates that more than 90% of the nation's homes will have a clear line of sight to the satellite.**

The DSS user interface is an on-screen point-and-shoot menu. Thomson officials demonstrated a menu system that could be configured to show programming by category (sports, movies, and comedies, for example) or by time and programming service. The system also allowed the review of current billing information.

The receiver also has other programmable features. Favorite-channel scan lists can be created for up to three users—mom, dad, and kids, perhaps. The receiver also allows "pay-per locks and limits" to be set. Parents could, for example, program per-event spending limits or rating ceilings to prevent their children from accessing undesirable programs. The entire system can also be locked unless the proper four-digit code is entered.

The front of the receiver has a slot for "smart card" insertion. The smart card contains subscription and decoding information and records program purchases. The conditional-access encryption method was developed by News Datacom.

Although the small dish helps make a DSS system far easier to install than a conventional satellite system, Thomson recommends that it be installed by

**RCA TECHNICIANS TEST an early DSS receiver.**



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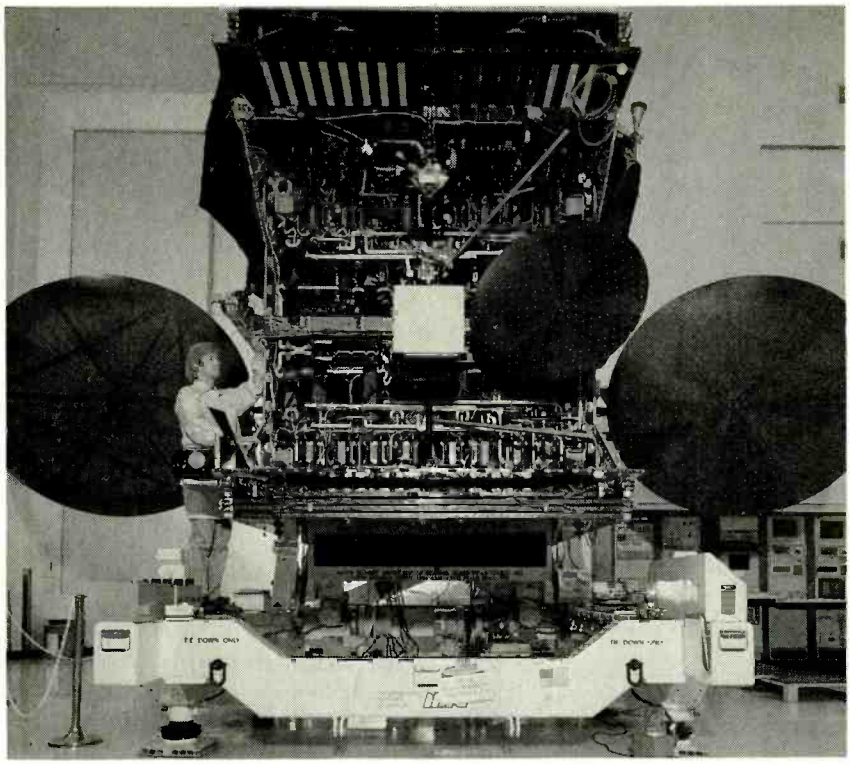

**THE FIRST HIGH-POWER DIRECT-BROADCAST SATELLITE shown here in its final assembly stages. It weighs about 3800 pounds.**

professionals. (This expense is not included in the purchase price.) Nevertheless, the company will provide a do-it-yourself kit containing all necessary cables and hardware for $69.95. A VHS video tape showing how to install the system is included.

Along with developing the receiver system, Thomson is also developing the digital compression hardware. Initially, programming from the satellite will be compressed in the MPEG-1 format. That format is the same one being used to put video on CD-ROM and CD-I discs. Thomson had hoped to have encoders for the improved MPEG-2 format ready for its product launch. Thomson executives say that assignment has proven to be more difficult than originally projected and—as of today—the company is behind schedule. When Thomson completes its developments of MPEG-2 encoders, broadcasts will shift to that compression scheme. All DSS receivers contain MPEG-2 decoders.

RCA executives like to point out their ability to shift from MPEG-1 to MPEG-2 as an example of the forward-compatibility of the DSS system. According to James E. Meyer, an RCA senior vice president, "It has the capability for receiving 16 × 9 wide-screen-format TV signals as well as HDTV broadcasts once that revolutionary technology is in place. . . . There will be no cries of 'interim technology' with the introduction of RCA DSS."

**The Hughes satellite**

The first DBS satellite, called DBS1, was launched in December 1993 from Kourou, French Guiana aboard an Arian rocket. A second satellite, also a Hughes model HS-601, is scheduled for launch in June. It will be co-located with the first satellite in geosynchronous orbit at 101° west longitude. That location is one of only eight orbital slots, spaced 5° apart, that are available for DBS in North America. The satellite's high power and wide spacing make small diameter antenna reception possible. The 101° west slot is the prime orbital position available because it is centered over the U.S.

Each satellite has sixteen high-power (120-watt) transponders. By comparison, C-band satellites that distribute conventional satellite TV to antenna dishes that are typically seven to ten feet in diameter have an average power of 16 watts per transponder.

Each transponder on analog satellites can distribute several audio signals and one, or sometimes two, video signals per transponder. The 32 transponders on the two DBS satellites can distribute about 150 channels of programming, thanks to digital "compression" or bit-rate reduction. An exact number of channels can't be given because not all programming will be compressed the same way. The compression ratio for, say, a live sporting event would be much lower than for an old black-and-white movie. The frame rate of the source material—and the desired quality of the output—also affect the compression ratio that can be achieved. Hughes estimates that each transponder can broadcast up to four live video signals or up to eight movies simultaneously.

The amplifiers, according to Hughes, will amplify either analog or digital signals, and will be capable of transmitting HDTV signals and compact disc-quality audio. The uplink signals will be sent from the DirecTv Castle Rock Broadcast Center in Colorado. The facility will be capable of transmitting up to 216 simultaneous broadcast channels to the two satellites.

The satellites have an expected operational lifetime of about twelve years. Although the electronics on board will probably still be operating after that time, the spacecraft will run out of fuel. Geostationary orbiting satellites require propellants to ensure their precise positioning because the gravitational effects of the sun and moon can move them.

**Will the service sell?**

All of the companies involved in the DSS project are optimistic about its chance for success. The first target will be the ten million rural homes that

*Continued on page 82*



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## SATELLITE TV

*continued from page 40*

have no access to cable TV. Although the service doesn't offer any truly new programming to consumers, Thomson is confident that it can also attract some of the 20 to 30 million homes that have access to cable but don't subscribe. Of course, there is also a potentially huge market of subscribers who, for one reason or another, are simply dissatisfied with their cable companies.

The expected break-even point for both Hughes and USSB, the two companies that invested in the satellite, is only about 3% of all households or 3 million subscribers. A DirecTv spokesman, stressing the system's value, flexibility, and performance, said, "We'd be very happy with 10% penetration over the next half dozen years. We think we're going to get that if our market research is anywhere near correct."

Thomson stresses that even those homeowners who don't subscribe to cable—although they have access to it—do rent video tapes, often on a daily basis. Pay-per-view programming, of course, eliminates the need to travel to a video rental store.

The DSS system claims quality advantages over conventional TV program distribution. At a demonstration attended by **Electronics Now**, the picture—sent digitally via a traditional satellite and decoded by a DSS receiver—approached laserdisc quality. Only large-dish satellite systems and videodiscs can offer similar quality. DSS also has a larger channel capacity than any existing cable system, and the pricing packages announced so far are less expensive than similar cable packages.

Some analysts point out that DSS could be superseded by the so-called information superhighway and its interactive systems. DSS is, however, here now. The consumers' appetite for programming has been proven by cable (66% penetration) and by video rentals (about $3.8 billion industry in 1992). Whether consumers want to interact with their TVs is still open to debate.

Another possible shortcoming for the system is that a consumer who wants to receive digital satellite programming must invest at least $700. However, project spokespersons point out that $700 is a small fraction of the cost of a new, large-screen TV—which requires the highest quality signals.

At this time, only one thing is certain. Consumers now have an additional source for video entertainment. Ω

## APRIL FOOL

*continued from page 75*

### Construction

First select the components you will use. Any buzzer that can be driven from a 9-volt battery will work. Be sure the buzzer is capable of making a sound loud enough to be startling. The buzzer must be small enough to fit inside the case you selected along with the 9-volt battery.

**IT'S A SIMPLE ENOUGH WARNING. But many an April Fool can't resist.**

Mount the mercury switch in a slightly tilted position so that when the box is lying flat on a table (waiting for a hapless victim), it is not enabled. The mercury switch can be fastened in place with a hot-melt glue gun. Glue the reed switch to an inside surface of the case so that the field of a magnet placed on the outside of the case will close it. The reset magnet, if small enough, can be fastened to the palm side of a low-priced ring to make it as inconspicuous as possible. Figure 2 shows the inside of the author's prototype. Ω



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